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Follow-on to Project [redacted]

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PROPOSED IMAGE CORRELATION TEST PROGRAMS

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PROPOSED IMAGE CORRELATION TEST PROGRAMS

We propose to conduct three specific sets of tests to obtain qualitative and quantitative data on the stability, accuracy and range of operation of automatic correlation logic.

The three sets of tests and the specific work to be done are as follows:

1. Distortion Feedback Servo Loop Stability

We propose to use an existing computer program on our PDP-1 computer/scanner equipment which will produce a scanning pattern similar to that used in our ARES and EROS equipment. This scanning pattern will be imaged upon a transparency, and the resultant transmitted light picked up by a photomultiplier. The photomultiplier output will be processed by an existing peak-and-valley detector (which may have to be modified), and the results stored in the computer memory.

Such scans will be performed in pairs, with the second scan pattern distorted slightly with respect to the first to represent image distortion. The stored data is then analyzed in a manner similar to that performed in EROS and ARES to produce error signals.

A new program will be written which will take these error signals and use them to change the degree of distortion of the second scan pattern of the pair. This change to be in a direction to reduce the error. The program will be written to cause the above sequence to repeat itself until all errors are negligible, or until the errors exceed some limit.

The performance of the system will then be tested under a wide variety of initial conditions and printed records obtained of the response under the various starting conditions.

The results of these tests and the conclusions drawn from them will be presented in a report.

2. Registration Correction Accuracy

Three classes of tests will be carried out in the EROS unit in order to determine the differential error between automatic and manual x and y parallax clearance. These tests are:

a. Measure this differential error in both x and y parallax clearance using identical plates of graduated and calibrated image resolution increments, at high and low magnifications. This test will serve as a calibration control for succeeding trials and the results will determine to a large extent, the amount of work required.

b. Measure this difference in x and y parallax clearance using plates with varying amounts of relief distortion and magnification.

c. Measure this difference in x and y parallax clearance using convergent panoramic dupe plates with varying magnification.

In order to conduct these tests, the EROS unit will be outfitted with floating mark reticles, one of which, is mounted on a precision x-y stage which must be controlled from the operator's normal viewing position. The floating mark system will be zeroed with respect to the automatic parallax clearance system. Each pair of plates will be moved to several different target areas; after automatic parallax clearance of each area, the automatic system will be

switched off and the floating marks will be "placed on the ground" manually. The change from the original parallax zero setting for each target area will be recorded. Numerical readout of the difference will be by means of a second observer which prevents the data from being biased, as well as, for constructional simplicity. Careful preparation of the test material is required and each plate will be sampled by approximately 25 microdensitometic traces according to procedures which have previously been established by [redacted] 25X1

The results of these tests will be presented in a report along with recommendations concerning future work on this subject.

3. Image Dissector Scan Distortion

We propose to modify and test the image dissector breadboard to be assembled on the stereo scanner program as follows. The scan pattern generators and amplifiers will be modified to permit the deflection signals to be modulated by the error signals detected by the correlation logic. Error signal amplifiers will be designed and constructed to facilitate the above modulation. The breadboard system will then be tested as a closed loop servo system independent of optical distortions. The characteristics of this system will be determined and studied with respect to applying this type of servo system to the stereo scanner. The system envisioned being that in which image distortions are initially accommodated by distortion of the image dissector scan patterns, then the magnitude of the scan distortions will be used as the error signals to be coupled to the servo motors which are to drive the optical elements. The potential advantages of this technique are: (1) the error signals delivered to the optical elements are free of the unbalance caused by image content; (2) faster system response to transients; (3) the reliability should

be improved because the detected errors are better matched to the scan pattern than to the optical elements; (4) ease of testing because of the separate closed servo loop completely within the electronic system.

The results of these tests will be a complete report on the tests and the recommendations as to whether to include this double servo loop approach in the stereo scanner.

SCHEDULE

The length of the effort on the three proposed test programs are:

#1	Three months
#2	Two and one-half months
#3	Three months

The actual elapsed time will be somewhat longer in order that the people and equipment be most effectively used. The series of tests should; however, be completed in less than a total of six months, including all reports.

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